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Nonminimal isotropic cosmological model with yang-mills and higgs fields

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Abstract

We establish a nonminimal Einstein-Yang-Mills-Higgs model, which contains six coupling parameters. The first three parameters relate to the nonminimal coupling of a non-Abelian gauge field and a gravity field, the next two parameters describe the so-called derivative nonminimal coupling of a scalar multiplet with a gravity field, and the sixth parameter introduces the standard coupling of a scalar field with a Ricci scalar. The formulated six-parameter nonminimal Einstein-Yang-Mills-Higgs model is applied to cosmology. We show that there exists a unique exact cosmological solution of the de Sitter type for a special choice of the coupling parameters. The nonminimally extended Yang-Mills and Higgs equations are satisfied for arbitrary gauge and scalar fields, when the coupling parameters are specifically related to the curvature constant of the isotropic space-time. Based on this special exact solution, we discuss the problem of a hidden anisotropy of the Yang-Mills field, and give an explicit example, when the nonminimal coupling effectively screens the anisotropy induced by the Yang-Mills field and thus restores the isotropy of the model.

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Keywords

Isotropic cosmological model, Nonminimal interaction, Yang-Mills-Higgs theory